

AMENDMENTS TO THE CLAIMS

Listing of Claims:

This Listing of Claims will replace all prior versions, and listings, of claims in the application:

1. (Currently Amended) An apparatus comprising:

an analysis chamber containing one or more cantilever structures, wherein the cantilever structures comprise one or more covalently attached partially double stranded nucleic acid templates, and wherein the cantilever structures have an oxide layer to reduce noise and have a sensitivity to respond proportionally to a mass dependent property change, deflection, or resonant frequency shift of the cantilever structures produced by changes in mass of the attached templates by addition of a single complementary mass labeled nucleotide;

a reagent reservoir in fluid communication with the analysis chamber, the reagent reservoir comprising a plurality of chambers for holding a plurality of different types of mass labeled nucleotides, wherein each different type of nucleotide is labeled with a distinguishable mass, and wherein the reagent reservoir is configured to introduce into the analysis chamber one type of mass labeled nucleotide at a time and to sequentially cycle the plurality of different types of mass labeled nucleotides through the analysis chamber;

a detection unit operably coupled to the cantilever structures, wherein the detection unit has a sensitivity to can proportionally detect to a mass dependent property change, deflection, or resonant frequency shift of the cantilever structures produced by changes in mass of the attached templates by addition of a single complementary mass labeled nucleotide; and

a data processing and control unit operably coupled to the analysis chamber, one or more reservoirs, and the detection unit;

further comprising one or more polymerases in the analysis chamber which incorporate the mass labeled nucleotides in positions complementary to nucleotides of the attached templates.

2. (Previously Presented) The apparatus of claim 1, wherein the one or more nucleic acid templates attached to the structures are about 10 to about 100,000 nucleotides in length.

3-4 (Canceled)

5. (Original) The apparatus of claim 1, wherein the detection unit comprises a position sensitive photodetector, a piezoelectric detector or a piezoresistor.

6. (Original) The apparatus of claim 1, wherein the detection unit comprises a laser.

7. (Previously Presented) The apparatus of claim 1, wherein the detection unit detects a mass property change of the cantilever structures, deflection of the cantilever structures, or resonant frequency shift of cantilever structures produced by the complementary mass labeled nucleotide.

8. (Currently Amended) An apparatus comprising:

a) an analysis chamber containing at least one cantilever;

b) one or more partially double stranded nucleic acid templates covalently attached to the at least one cantilever, wherein the at least one cantilever has an oxide layer to reduce noise and has a sensitivity to proportionally responds to deflection and/or resonant frequency shift of the cantilever produced by changes in mass of the attached templates by addition of a single complementary mass labeled nucleotide;

c) a detection unit operably coupled to the at least one cantilever to detect deflection of the at least one cantilever, wherein the detection unit ~~has a sensitivity to~~ can proportionally detect ~~to a~~ mass dependent property change, deflection, or resonant frequency shift of the cantilever structures produced by changes in mass of the attached templates by addition of a single complementary mass labeled nucleotide;

d) a reagent reservoir configured to sequentially cycle a plurality of different types of mass labeled nucleotides through the analysis chamber; and

e) a data processing unit and control unit operably coupled to the analysis chamber and the detection unit;

further comprising one or more polymerases in the analysis chamber which incorporate the mass labeled nucleotides in positions complementary to nucleotides of the attached templates

9. (Canceled).

10. (Previously Presented) The apparatus of claim 8, wherein the data processing and control unit is a computer.

11. (Original) The apparatus of claim 8, wherein the detection unit comprises a laser and a position sensitive photo detector.

12. (Original) The apparatus of claim 8, wherein the detection unit comprises a piezoelectric detector, a piezoresistive detector or a piezomagnetic detector.

13. (Previously Presented) The apparatus of claim 8, wherein the one or more nucleic acid templates are about 10 to approximately 100,000 nucleotides in length.

14. (Original) The apparatus of claim 8, further comprising an array of cantilevers, each associated with the same molecule.

15. (Original) The apparatus of claim 8, further comprising an array of cantilevers, each associated with a different molecule.

16. (Currently Amended) An apparatus comprising:

a) an analysis chamber containing at least one cantilever;

b) one or more partially double stranded nucleic acid templates covalently attached to the at least one cantilever, wherein the at least one cantilever has an oxide layer to reduce noise and has a sensitivity to proportionally responds to deflection and/or resonant frequency shift of the cantilever

produced by changes in mass of the attached templates by addition of a single complementary mass labeled nucleotide;

c) a piezoresistive resistor embedded at the fixed end of at least one cantilever;

d) a detection unit operably coupled to the piezoresistive resistor to detect deflection of the at least one cantilever, wherein the detection unit ~~has a sensitivity to~~ can proportionally detect to a mass dependent property change, deflection, or resonant frequency shift of the cantilever structures produced by changes in mass of the attached templates by addition of a single complementary mass labeled nucleotide;

e) a reagent reservoir configured to sequentially cycle a plurality of different types of mass labeled nucleotides through the analysis chamber; and

f) a data processing and control unit operably coupled to the analysis chamber and the detection unit;

further comprising one or more polymerases in the analysis chamber which incorporate the mass labeled nucleotides in positions complementary to nucleotides of the attached templates.

17. (Original) The apparatus of claim 16, further comprising a resistance measuring device.

18. (Previously Presented) The apparatus of claim 16, wherein the one or more nucleic acid templates are about 10 to approximately 100,000 nucleotides in length.

19. (Currently Amended) An apparatus comprising:

- a) an analysis chamber containing at least one cantilever;
- b) the at least one cantilever coated with a substance on at least one surface;
- c) two or more partially double stranded nucleic acid templates covalently coupled to the coated surface of the at least one cantilever in a selected pattern, wherein the at least one cantilever has an oxide layer to reduce noise and has a sensitivity to proportionally responds to a mass dependent property change, deflection, or resonant frequency shift of the cantilever structures produced by changes in mass of the coupled templates by addition of a single complementary mass labeled nucleotide;
- d) one or more polymerases in the analysis chamber;
- e) a detection unit operably coupled to the at least one cantilever to detect deflection of the at least one cantilever, wherein the detection unit has a sensitivity to can proportionally detect to a mass dependent property change, deflection, or resonant frequency shift of the cantilever structures produced by changes in mass of the attached templates by addition of a single complementary mass labeled nucleotide;
- f) a reagent reservoir configured to sequentially cycle a plurality of different types of mass labeled nucleotides through the analysis chamber; and
- g) a data processing and control unit operably coupled to the analysis chamber and the detection unit.

20. (Original) The apparatus of claim 19, wherein the substance comprises an alloy.

21. (Original) The apparatus of claim 20, wherein the alloy is gold.

22. (Previously Presented) The apparatus of claim 18, wherein the nucleic acid templates are coupled to the cantilever through a thiol group.